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EXAMINER

HUISMAN, DAVID J

ART UNIT	PAPER NUMBER
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2183

DATE MAILED: 08/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/478,714

Applicant(s)

EL-KIK ET AL.

Examiner

David J. Huisman

Art Unit

2183

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 January 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 7 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 January 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. Claims 1-16 have been examined.

Papers Submitted

2. It is hereby acknowledged that the following papers have been received and placed of record in the file: Change of Address as received on 9/5/00.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a) because they fail to show:
 - a) In FIG.1, the RDN signal provided by the chip select/internal address generator (122) to the memory (125) referenced on page 5, lines 18-19 on the specification.

Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d).

5. The drawings are objected to because the memory chip-select line (133) in FIG.1 is shown to be a 32-bit line (bits 31:0), whereas in the specification, in Table 1 and on page 5, lines 14-15, it is disclosed to be a 5-bit line in order to specify one of 32 different memory banks. Please change the drawing from [31:0] to [14:10]. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are

Art Unit: 2183

required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

6. Claim 7 is objected to because of the following informalities: Please replace the word "cycles" in line 9 of claim 7 to --cycle--. Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-8 and 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Evoy et al., U.S. Patent No. 6,085,307 (herein referred to as Evoy) in view of McCarthy et al., U.S. Patent No. 6,321,310 B1 (herein referred to as McCarthy).

9. Referring to claim 1, Evoy has taught a dual processor system, comprising:

a) a first processor coupled to a system address bus and a data bus. See Fig.2.

b) a second processor coupled to the system address bus and to the data bus (see Fig.2), whereby the second processor comprises:

c) a control register having a control register system address. See Fig.2 (57) and column 2, lines 47-52.

Art Unit: 2183

d) an internal memory. It is well known in the art that processors contain memory whether it is a RAM, ROM, etc. The memory is used to store instructions or values obtained while executing instructions. In addition, a person of ordinary skill in the art would have recognized that although Evoy has taught communication between two processors through a shared memory source, it is just as plausible to have two processors, each having their own memory to store data/instructions. Then the data transfers would occur directly between the two processors as opposed to a single memory source. One advantage of this scheme is that both processors have access to their respective memories without contention. With a single, shared memory, one processor will have to wait for the other processor to finish before it can access memory, resulting in delayed execution and more time wasted. Therefore, to minimize the time required to access memory, it would have been obvious to a person of ordinary skill in the art at the time of the invention to incorporate local, internal memories for each processor.

e) a data register having a data register system address and coupled to the internal memory. See column 5, lines 1-7. Data registers are used to hold intermediate data. In addition, it is well known in the art that data registers are coupled to the processor's internal memory in order to hold data that is to be retrieved from or written to memory.

f) an internal address generator coupled to the control register and to the internal memory. In Evoy's system, the internal control register includes a program counter (see column 5, lines 1-3), which is well known in the art to hold an address of an instruction in memory. Therefore, it would be inherent that an internal address generator would be coupled to the control register and also to the internal memory in order to decode the address being held in the program counter and then access the correct memory address.

Art Unit: 2183

g) the control word is written into the control register when the first processor places a control word having a burst mode bit and a starting internal address on the data bus and asserts the control register system address on the system address bus. Evoy has taught the connection and interaction between two processors. Evoy did not explicitly teach a burst data transfer between them. However, McCarthy taught a system in which a single or burst data transfer occurs between a first processor and a co-processor before being stored in memory. See Fig. 1 and a brief explanation in column 5, lines 61-67 and column 6, lines 1-5. Using the concept of an internal co-processor memory explained above, McCarthy's teachings would be applied to Evoy's system in order to allow the processors to communicate directly with each other without the use of a shared memory. In addition, a person of ordinary skill in the art would have recognized that if a first processor wanted to transfer a burst of data and/or instructions to a second processor, the first processor would have to first inform the second processor of the desired operating mode in order to prepare the second processor to receive multiple data elements. McCarthy's system uses instructions to implement the single and burst data transfers. See column 5 for examples. It is inherent that the instructions, when decoded and propagated along the data bus, will specify the type of transfer to take place (through a single bit or multiple bits) along with the starting internal address. The concept of McCarthy's system can be applied to Evoy's system such that the second processor will recognize the beginning of a burst transfer (based on the instruction issued by the first processor) and its memory address registers (accessed through the control register, which has an address) will hold the starting internal address. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that in order to store the starting internal address in the memory register of the

second processor, the first processor must write the control word to the second processor's control register by applying the control register's address on the address bus and the control word on the data bus.

h) the second processor enters a burst mode in which the internal address generator selects consecutive memory locations of the internal memory, starting at the starting internal address specified in the control word stored in the control register, during subsequent data transfer cycles, when the control word has a burst mode bit indicating burst mode. When the dual processor system is in burst mode, time would be saved by not having the first processor generate a new memory address for each new element it must transfer. McCarthy has taught a burst mode in which the first processor provides the starting address and the co-processor selects consecutive memory addresses for each new data element that it receives. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the internal address generator of Evoy select consecutive memory addresses as transfers occur. This would allow the first processor to refrain from sending a new address each time, resulting in less computation time.

10. Referring to claim 2, Evoy in view of McCarthy has taught an invention as described in claim 1. Evoy has further taught that the dual processor system is implemented as an integrated circuit. See column 5, lines 52-61, and Fig.2.

11. Referring to claim 3, Evoy in view of McCarthy has taught an invention as described in claim 1. It is inherent that it is undesirable for the second processor to be in burst transfer mode all of the time because it would not have a chance perform floating point or DSP calculations, for example. Therefore, a person of ordinary skill would have recognized that the first processor

should provide some sort of signal to the second processor in order to specify the end of burst transfer mode. Since the first processor has already provided the starting address on the address bus at the beginning of burst mode, it would make sense to continue asserting the same address until burst mode is scheduled to end because no extra work would be required by the first processor. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have the second processor remain in burst mode as long as the first processor continues to apply the original starting address to the address bus.

12. Referring to claim 4, Evoy in view of McCarthy has taught an invention as described in claim 1. It is well known that when a burst data write takes place, multiple data elements will be involved. In order for the data elements to be transferred and received correctly, they must be processed individually due to the existence of a single data bus. McCarthy has further taught that when transferring data, a buffer is used as an intermediate step to hold multiple data elements. See Fig. 1 (26). A person of ordinary skill in the art would have recognized that a data register would provide the same functionality as a buffer. It would be used to hold data received by the second processor until its memory is available from the previous write. Without the data register (buffer), the first processor would be transferring data directly to the memory of the second processor and because memory is slower than registers, the first processor would have to delay its transfer each time until the memory become available. This would result in less productive work being accomplished and time being wasted. Therefore, in order to achieve a more efficient dual processor system, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the first processor write all of its data words to the second processor's data register via the data bus by supplying the data register address on the system

address bus. Furthermore, it would be unproductive for the first processor, in addition to transferring each data word, to also calculate and supply a new memory address each time a new word is transferred. A person of ordinary skill in the art would have recognized that since the second processor is currently storing the starting internal memory address, the internal address generator would select consecutive memory locations of the internal memory as new data words are stored.

13. Referring to claim 5, Evoy in view of McCarthy has taught an invention as described in claim 1. It is well known that when a burst data read takes place, multiple data elements will be involved. In order for the data elements to be transferred and received correctly, they must be processed individually due to the existence of a single data bus. McCarthy has further taught that when receiving data, a buffer is used as an intermediate step to hold multiple data elements. See Fig. 1 (26). A person of ordinary skill in the art would have recognized that a data register would provide the same functionality as a buffer. It would be used as intermediate storage to hold data retrieved from the second processor's memory. Without the data register (buffer), the first processor would have to read data directly from the second processor's internal memory. This doesn't pose a big problem but it is rather unproductive. For example, if the data register did not exist as an intermediate storage step, then the first processor would be responsible for reading each value, one at a time, from the second processor's memory. If the first processor needs to perform some other type of work in between reads, it will have to return to memory at a later time to continue with the reads, while the second processor is of no help. On the other hand, if the buffer is implemented and the first processor has to do other work, then the second processor will work to fill the buffer in the meantime as the first processor executes something

Art Unit: 2183

else. When the first processor is ready to read again, it will simply go to the register file that has been filled with data by the second processor. The advantage is avoiding the time for the first processor to access the internal memory since registers are faster. This would result in a much more productive system. Therefore, in order to achieve a more efficient dual processor system, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the first processor read all of the data words from the second processor's data register via the data bus by supplying the data register address on the system address bus. Furthermore, it would be unproductive for the first processor, in addition to transferring each data word, to also calculate and supply a new memory address each time a new word is to be read. A person of ordinary skill in the art would have recognized that since the second processor is currently storing the starting internal memory address, the internal address generator would select consecutive memory locations of the internal memory as new data words are read.

14. Referring to claim 6, Evoy in view of McCarthy has taught an invention as described in claim 1. Evoy has further taught that the second processor is a co-processor. See Fig.2 (50).

15. Referring to claim 7, Evoy in view of McCarthy has taught an invention as described in claim 1. Please note that lines 2-5 of claim 7 are identical to lines 8-11 of claim 1 and therefore the rejection of that section of claim 7 can be referenced in the rejection of claim 1(g) above.

Furthermore, the second processor enters a single data transfer mode in which the internal address generator selects the starting internal address specified in the control word stored in the control register, during a next data transfer cycle when the control word has a burst mode bit that does not indicate burst mode. A person of ordinary skill in the art would have recognized that at times, a first processor will only need to transfer a single data word to a second processor. In

reality, this single data transfer is merely a load or store instruction. If burst mode were the only available mode, then it would be unproductive for the second processor to prepare itself for a burst transfer (i.e. get ready to increment the memory addresses). In addition, in burst mode, the second processor would still be expecting data to be transferred after the single transfer. This would result in the second processor remaining idle until the first processor indicates that burst mode is over. If a single mode were implemented, the second processor would immediately return to work as soon as the first transfer is over instead of waiting for the first processor's indication that burst mode is over. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement a single data transfer mode when the burst mode bit does not indicate burst mode. This would result in a more productive system.

16. Referring to claim 8, Evoy in view of McCarthy has taught an invention as described in claim 1. As described in the rejection of claim 1 above, Evoy has taught a first and second processor intercoupled by the system address and data buses. In addition, it is well known in the art that processors contain some form of read, write, and chip select signal lines. A person of ordinary skill in the art would have recognized that read and write lines would be used by the first processor to "tell" the second processor whether it will be receiving or transmitting data, respectively. Also, Evoy has taught an enable flag that is used to start and stop the co-processor's operation. Please see Fig.3. The enable flag works the same way as a chip-select line. Basically, the main processor issues an instruction that sets or clears the enable flag (chip select). That value then determines whether or not the co-processor operates.

17. Referring to claim 10, Evoy in view of McCarthy has taught a dual processor system in which data is transferred between two processors. It is noted by the examiner that the only

Art Unit: 2183

difference between claim 10 and claim 1 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 10 is based on the same reasons as mentioned above in the rejection of claim 1.

18. Referring to claim 11, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 11 and claim 3 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 11 is based on the same reasons as mentioned above in the rejection of claim 3.

19. Referring to claim 12, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 12 and claim 4 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 12 is based on the same reasons as mentioned above in the rejection of claim 4.

20. Referring to claim 13, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 13 and claim 5 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 13 is based on the same reasons as mentioned above in the rejection of claim 5.

21. Referring to claim 14, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 14 and claim 6 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single

integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 14 is based on the same reasons as mentioned above in the rejection of claim 6.

22. Referring to claim 15, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 15 and claim 8 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 15 is based on the same reasons as mentioned above in the rejection of claim 8.

23. Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Evoy in view of McCarthy as applied to claims 1-8 and 10-15 above and in further view of Curran et al., U.S. Patent No. 6,334,179 B1 (herein referred to as Curran).

24. Referring to claim 9, Evoy in view of McCarthy has taught an invention as described in claim 1.

a) Evoy has taught a single memory bank that is accessed by the processor. Evoy has not taught of multiple memory blocks. Curran, on the other hand, has taught the concept of a dual processor system in which multiple memory blocks are implemented. See Fig.1. A person of ordinary skill in the art would have recognized that a plurality of memory banks would replace a single internal memory. A reason for this would be to increase organizational flexibility. For instance, if two memory banks were used, one bank would be used specifically for data and the other for instructions, or something to that effect. Or, in the case of Curran, the use of memory blocks provides increased bandwidth in that each bank can be read or written to at the same time.

Art Unit: 2183

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a plurality of memory blocks as opposed to a single memory block.

b) It should be further noted that if multiple memory blocks were implemented, the processor must be able to access each bank individually. It is well known in the art that each memory bank is assigned a different chip-select address and when that address is applied to each bank, only the bank with that chip-select address will be active. A person of ordinary skill in the art would have recognized that the control word size of the system with the single memory would not have to change to implement multiple memory banks. Instead, in addition to the burst-mode bit field, the upper N bits of the original memory address will become the memory bank chip select address, where 2^N = amount of memory banks, and the remaining bits will be used to specify a memory location within the specified bank that will be used as the starting internal address of the data transfer.

c) Once the control register holds the control word written by the first processor, the transfer mode will be determined, the correct memory bank will be selected, and the internal starting bank address will be known. A person of ordinary skill in the art would have recognized that in order to activate a memory bank and determine a starting address, the control register bits must be decoded by the internal address generator logic and applied to the memory bank chip-select and address lines.

25. Referring to claim 16, Evoy in view of McCarthy has taught an invention as described in claim 10. It is noted by the examiner that the only difference between claim 16 and claim 9 is the claiming of an integrated circuit. Evoy has further taught that both processors are on a single

Art Unit: 2183

integrated circuit. See column 5, lines 52-61 and Fig.2. Therefore, the rejection of claim 16 is based on the same reasons as mentioned above in the rejection of claim 9.

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is reminded that in amending in response to a rejection of claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by the references cited and the objections made. Applicant must also show how the amendments avoid such references and objections. See 37 CFR § 1.111(c).

Iwasaki et al., U.S. Patent No. 4,894,768 has taught communication between a first processor and one or more coprocessors coupled to a system address and data bus.

Goettsch, U.S. Patent No. 6,112,262 has taught a system and method for efficiently transferring a burst of information between processors.

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David J. Huisman whose telephone number is (703) 305-7811. The examiner can normally be reached on Monday-Friday (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (703) 305-9712. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7238 for After Final communications.


Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Art Unit: 2183

DJH

David J. Huisman

August 20, 2002


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